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10/620,987	07/16/2003	Angeliki Alexiou	4-2	8825

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Docket Administrator
Lucent Technologies Inc.
Room 3J-219
101 Crawfords Corner Road
Holmdel, NJ 07733-3030

EXAMINER

TRAN, KHANH C

ART UNIT	PAPER NUMBER
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2611

DATE MAILED: 10/30/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/620,987

Applicant(s)

ALEXIOU ET AL.

Examiner

Khanh Tran

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 July 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 27 is/are allowed.
- 6) ☒ Claim(s) 1-4, 7, 8, 11-16, 19, 20 and 23-26 is/are rejected.
- 7) ☒ Claim(s) 5, 6, 9, 10, 17, 18, 21 and 22 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 19 December 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-4, 7-8, 11, 13-16, 19-20 and 23-26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Walton et al. U.S. Patent 7,072,413 B2.

Regarding claim 1, Walton et al. invention provide techniques to process data for transmission over multiple transmission channels selected from among all available transmission channels.

In column 3 lines 40-50, FIG. 1 is a diagram of a multiple-input multiple-output (MIMO) communication system 100. In column 4 lines 35-50, Walton et al. further teaches to more fully utilize the capacity of the transmission channels, channel state information (CSI) descriptive of the link conditions may be determined (typically at the receiver system) and provided to the transmitter system.

The transmitter system may then process (e.g., encode, modulate, and weight) data such that the transmitted information bit rate for each transmission channel matches the transmission capacity of the channel. FIG. 6A is an embodiment of channel MIMO/data processor 520x, which includes a

spatial/space-time processor 610; see column 27 lines 30-45. In view of that, the transmitter applies space time block encoding on the transmission data. In column 5 lines 5-30, Walton et al. teaches processing data for all selected transmission channels based on a common coding and modulation scheme to provide modulation symbols, and (2) weight the modulation symbols for each selected transmission channel based on the channel's CSI.

Walton et al. does not explicitly teach estimating reliability of the channel state information as claimed in the application claim.

In one embodiment, Walton et al. teaches only "good" transmission channels having SNRs (or power gains) at or above a particular SNR (or power gain) threshold are selected for use for data transmission, and "bad" transmission channels are not used. With selective channel inversion, the total available transmit power is distributed across the good transmission channels, and improved efficiency and performance are achieved. As recited above, because weighting the modulation symbols for each selected transmission channel based on the channel's CSI, one of ordinary skill in the art at the time the invention was made would have recognized that "bad" transmission channels are due to channel's bad CSI, or in another word, unreliable CSI.

In column 22 lines 25-40, for full-CSI processing, each preconditioned modulation symbol, for a particular transmit antenna represents a linear combination of the weighted modulation symbols for up to N_C spatial subchannels.

Regarding claim 2, as recited in claim 1 rejection, the channel state information (CSI) descriptive of the link conditions may be determined or estimated (typically at the receiver system) and provided to the transmitter system; see also column 29 50-67 in which CSI comprises SNR, which is typical a SNR estimate.

Regarding claim 3, in column 30 line 60 via column 31 line 15, CSI comprises a differential indicator for a particular measure of quality for a transmission channel. The differential indicator may indicate to increase or decrease the last reported measurement by a particular step size (or to maintain the last reported measurement). For example, the differential indicator may indicate that (1) the observed SNR for a particular transmission channel has increased or decreased by a particular step size, or (2) the data rate should be adjusted by a particular amount, or some other change.

Regarding claim 4, as recited in the rejection of claim 1 and 3, the weight the modulation symbols for each selected transmission channel based on the channel's CSI. Furthermore, in column 5 lines 5-30, the weighting effectively "inverts" the selected transmission channels such that, in general, the SNRs are approximately similar at the receiver system for all selected transmission channels. In one embodiment, which is referred to as selective channel inversion (SCI), only "good" transmission channels having SNRs (or power gains) at or above a particular SNR (or power gain) threshold are selected for use for data transmission, and "bad" transmission channels are not used. With selective channel inversion, the total available transmit power is distributed

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across the good transmission channels, and improved efficiency and performance are achieved. In light of the foregoing teaching, the weighting depends upon channel state information (CSI) stability.

Regarding claim 7, as recited in claim 1 rejection, for full-CSI processing, each preconditioned modulation symbol, for a particular transmit antenna represents a linear combination of the weighted modulation symbols for up to N_C spatial subchannels. In light of that, the linear combination is applied before the block encoding.

Regarding claim 8, referring to FIG. 4D, because the combiners 434A ... 434T are at the end of space time encoding block, the linear combination is applied after the space time block encoding.

Regarding claim 11, in column 3 lines 25-45, Walton et al. teaches that the multi-channel communication systems implement code division multiple access (CDMA).

Regarding claim 13, claim is rejected on the same ground as for claim 1 because of similar scope.

Regarding claim 14, claim is rejected on the same ground as for claim 2 because of similar scope.

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Regarding claim 15, claim is rejected on the same ground as for claim 3 because of similar scope.

Regarding claim 16, claim is rejected on the same ground as for claim 3 because of similar scope.

Regarding claim 19, claim is rejected on the same ground as for claim 7 because of similar scope.

Regarding claim 20, claim is rejected on the same ground as for claim 8 because of similar scope.

Regarding claim 23, claim is rejected on the same ground as for claim 11 because of similar scope.

Regarding claim 24, claim is rejected on the same ground as for claim 12 because of similar scope.

Regarding claim 25, in column 27 lines 30-67, FIG. 6A discloses MIMO/data processor 520x includes spatial/space-time processor 610 performing linear spatial processing on the N_R received signals for a non-dispersive MIMO channel or space-

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time, a CSI processor 612 for determining the CSI for each of the transmission channels used for data transmission.

Walton et al. does not expressly teach a channel estimator.

In column 20 lines 5-15, Because Walton et al. further suggests pilot data (e.g., data of known pattern) may be used at the receiver to perform channel estimation, it would have been obvious for one of ordinary skill in the art at the time the invention was made that Walton et al. MIMO/data processor 520x can be further modified to include a channel estimator.

Regarding claim 26, claim is rejected on the same ground as for claim 11 because of similar scope.

2. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Walton et al. U.S. Patent 7,072,413 B2 as applied to claim 11 above, and further in view of Ratnarajah U.S. Patent 6,980,600 B1.

Regarding claim 12, Walton et al. does not teach the invention applies to the UMTS as claimed in the application claim.

Ratnarajah teach a similar OFDM MIMO system, which may be applied to UMTS base transceiver station; see column 11 lines 5-25. Because OFDM MIMO system can be applied to multi-user detection, one of ordinary skill in the art at the time the invention

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wade made would have been motivated to modify Walton et al. teaching to apply to the UMTS base station.

Allowable Subject Matter

3. Claims 5-6, 9-10, 17-18 and 21-22 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

4. Claim 27 is allowed.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claim 27, claim is allowable over prior art of record because the cited references taken individually or in combination cannot teach or suggest the claimed uniquely distinct features "a processor operative to determine the coefficients of a further linear transformation matrix dependent upon the channel state information and the estimated reliability of the channel state information to be applied to a further data sequence for transmission, the coefficients of the further linear transformation matrix being sent from the receiver to the transmitter for use".

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Ratnarajah U.S. Patent 6,980,600 B1 discloses "Receiver System For Multiple-Transmit, Multiple-Receive (MTMR) Wireless Communications Systems".

Thielecke et al. U.S. Patent 7,120,199 B2 discloses "Link Adaptation For MIMO Transmission Schemes".


6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh Tran whose telephone number is 571-272-3007. The examiner can normally be reached on Monday - Friday from 08:00 AM - 05:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jay Patel can be reached on 571-272-2988. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KCT


Khanh Tran
Primary Examiner